



# AN2759 Application note

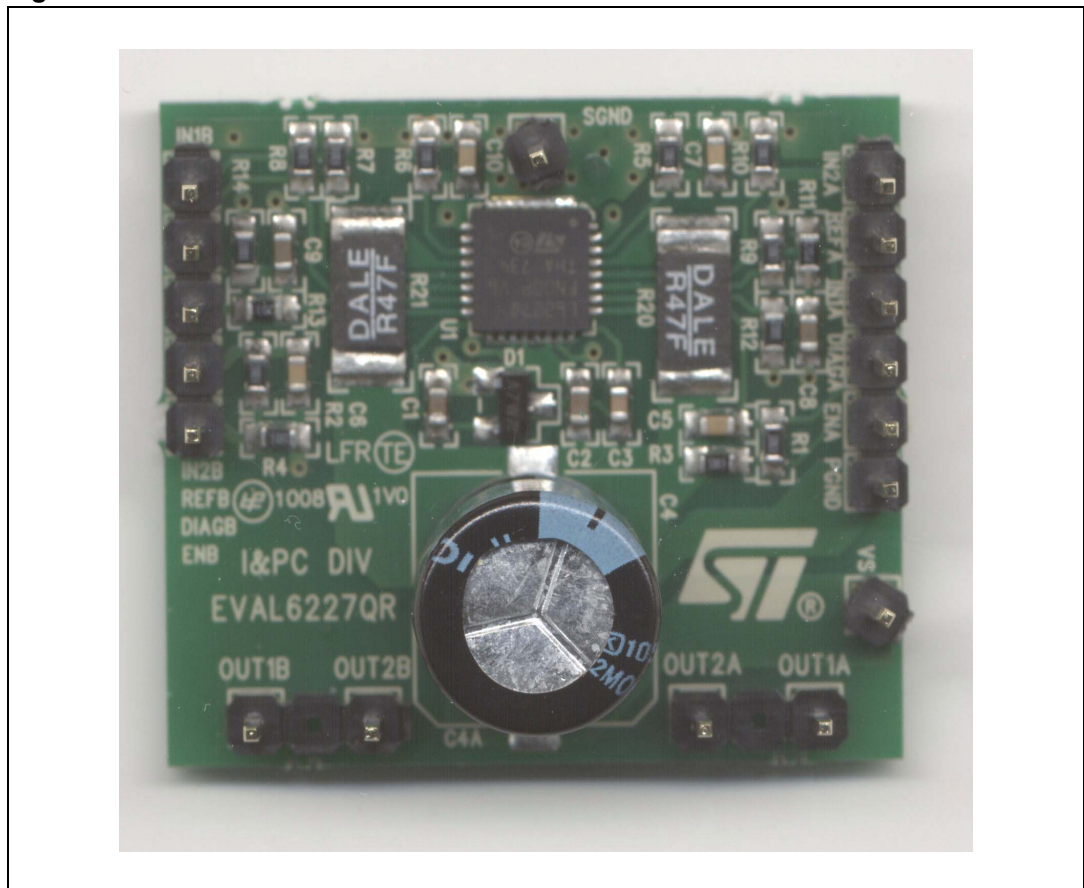
## EVAL6227QR demonstration board using a dual full-bridge L6227Q for motor control applications

### Introduction

This application note describes the demonstration board of the DMOS dual full-bridge L6227Q designed for motor control applications. The board implements a typical application that can be used as a reference design to drive two-phase bipolar stepper motors with currents up to 1A DC, multiple DC motors and a wide range of inductive loads.

Thanks to the small footprint of the L6227Q (QFN 5 x 5 mm, 32-lead) the PCB is very compact (27 x 32 mm).

Figure 1. EVAL6227QR demonstration board



# Contents

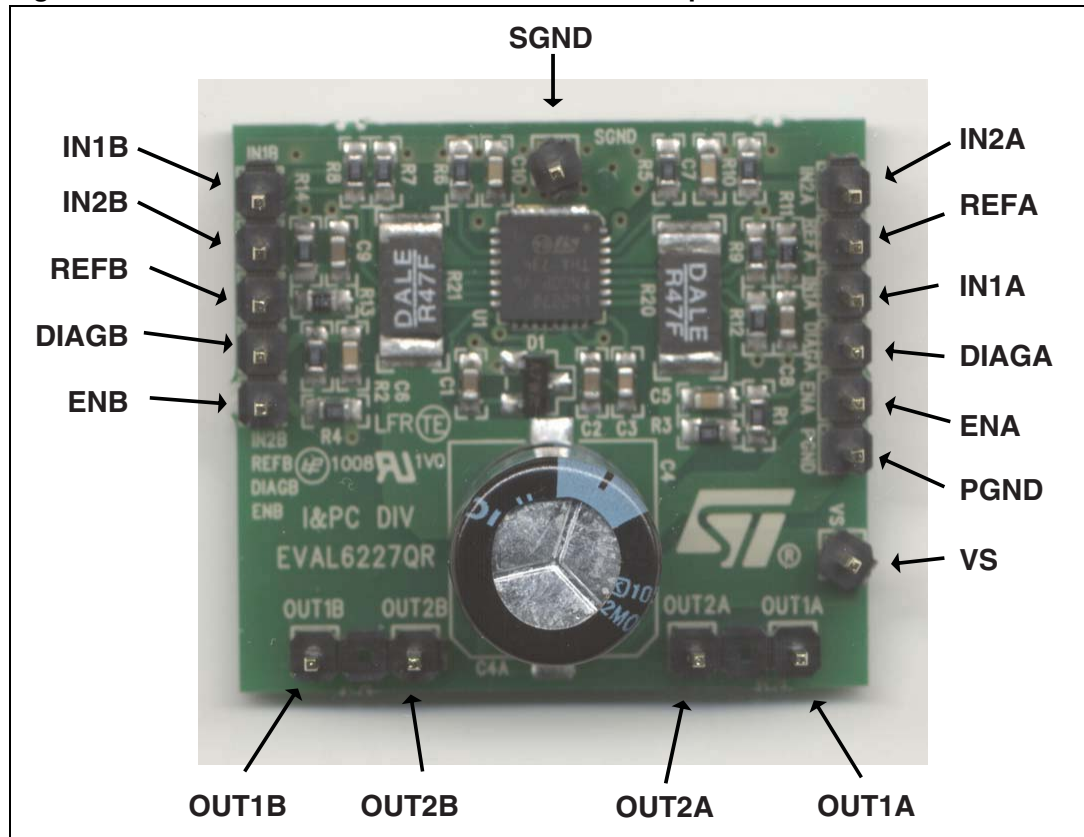
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# 1 Demonstration board description

**Table 1. EVAL6227QR pin connections**

| Name  | Type              | Function  |
|-------|-------------------|---|
| VS    | Power supply      | Bridge A and bridge B power supply  |
| PGND  | Ground            | Power ground terminal   |
| IN1A  | Logic input       | Bridge A logic input 1  |
| IN2A  | Logic input       | Bridge A logic input 2  |
| ENA   | Logic input       | Bridge A enable (active high). When low, the power DMOSs of bridge A are switched OFF.              |
| IN1B  | Logic input       | Bridge B logic input 1  |
| IN2B  | Logic input       | Bridge B logic input 2  |
| ENB   | Logic input       | Bridge B enable (active high). When low, the power DMOSs of bridge B are switched OFF.              |
| DIAGA | Open drain output | Bridge A diagnostic pin. When low, an overcurrent or overtemperature event of bridge A is signaled. |
| DIAGB | Open drain output | Bridge B diagnostic pin. When low, an overcurrent or overtemperature event of bridge B is signaled. |
| SGND  | Ground            | Signal ground terminal  |
| REFA  | Analog input      | Bridge A current controller reference voltage   |
| REFB  | Analog input      | Bridge B current controller reference voltage   |
| OUT1A | Power output      | Bridge A output 1   |
| OUT2A | Power output      | Bridge A output 2   |
| OUT1B | Power output      | Bridge B output 1   |
| OUT2B | Power output      | Bridge B output 2   |

Figure 2. EVAL6227QR demonstration board description



The INx input pins drive the corresponding half-bridge. When low logic level is applied, the low side MOS is switched on, whereas a high logic level turns on the high side MOS.

To perform the PWM current control an analog reference voltage should be provided to each channel of the driver. A fixed reference voltage can be easily obtained through a resistive divider from an external voltage rail and GND (can be the one supplying the microcontroller or the rest of the application).

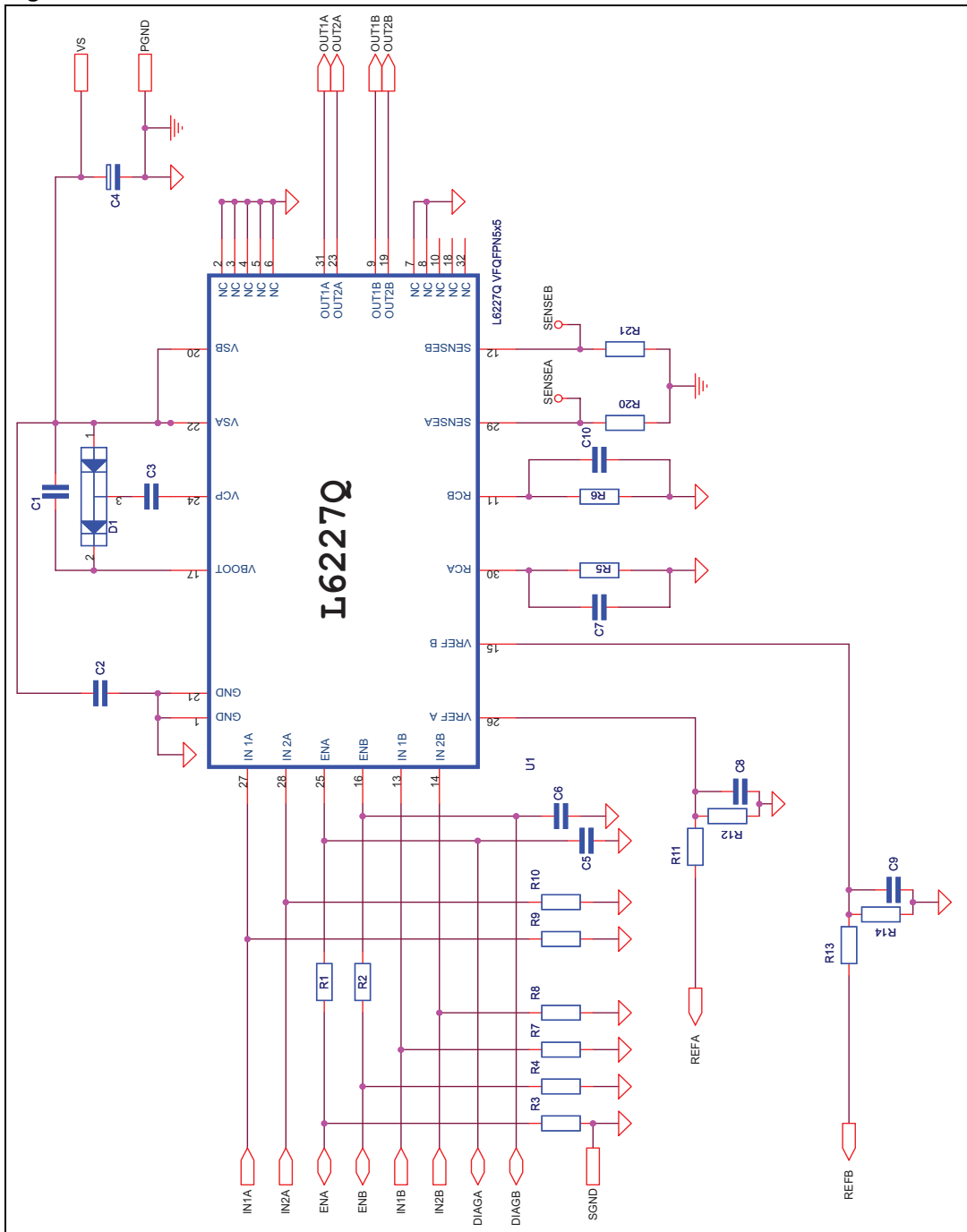
Otherwise a very simple way to obtain a variable voltage without using a DAC is to low-pass filter a PWM output of a microcontroller.

Table 2 summarizes the electrical specification of the application and Figure 3 shows the electrical schematic.

Table 2. EVAL6227QR electrical specification (recommended value)

| Parameter                                     | Value         |
|---|---------------|
| Supply voltage range (VS)                     | 8 to 52 Vdc   |
| RMS output current rating (OUTx)              | up to 1.4 A   |
| Switching frequency                           | up to 100 kHz |
| Input and enable voltage range                | 0 to + 5 V    |
| Voltage reference range (REFA, REFB)          | 0 to + 5 V    |
| Operating temperature range                   | -25 to +125°C |
| L6227Q thermal resistance junction to ambient | 22°C/W        |

Figure 3. EVAL6227QR demonstration board schematic



**Table 3. EVAL6227QR part list**

| Part reference                  | Part value         | Part description              |
|---------------------------------|--------------------|-------------------------------|
| C1                              | 220 nF/25 V        | Capacitor                     |
| C2                              | 220 nF/63 V        | Capacitor                     |
| C3                              | 10 nF/25 V         | Capacitor                     |
| C4                              | 100 µF/63 V        | Capacitor                     |
| C5, C6                          | 5.6 nF             | Capacitor                     |
| C7, C10                         | 820 pF             | Capacitor                     |
| C8, C9                          | 220 nF             | Capacitor                     |
| D1                              | BAT46SW            | Diode                         |
| R1, R2, R3, R4, R7, R8, R9, R10 | 100 kΩ, 5%, 0.25 W | Resistor                      |
| R5, R6                          | 100 kΩ, 1%, 0.25 W | Resistor                      |
| R11, R13                        | 20 kΩ, 5 %, 0.25 W | Resistor                      |
| R12, R14                        | 2 kΩ, 5 %, 0.25 W  | Resistor                      |
| R20, R21                        | 0.4 Ω, 1 W         | Resistor                      |
| U1                              | L6227Q             | Dual full-bridge in VFQFPN5x5 |

D1, C1 and C3 constitute a charge pump circuit, which generates the supply voltage for the high-side integrated MOSFETs. Due to voltage and current switching at relatively high frequency, these components are connected through short paths in order to minimize induced noise on other circuitries.

R1, R2 and C5, C6 are used by the overcurrent protection integrated circuitry (disable time  $t_{DISABLE}$  is about 200 µs and delay time  $t_{DELAY}$  about 1 µs using the values in [Table 3](#)).

R5, C7 and R6, C10 are used to set the off-time  $t_{OFF}$  of the two PWM channels at about 50 µs. The off-time should be adjusted according to the motor electrical characteristics and supply voltage by changing R5, C7 and R6, C10 values.

R11, R12, C8 and R13, R14, C9 are low-pass filters which provide an external reference voltage through a PWM output of a microcontroller.

[Figure 4](#), [Figure 5](#) and [Figure 6](#) show the placement of the components and the layout of the two layers of the EVAL6227QR demonstration board. A GND area has been used to improve the IC power dissipation.

Figure 4. Component placement

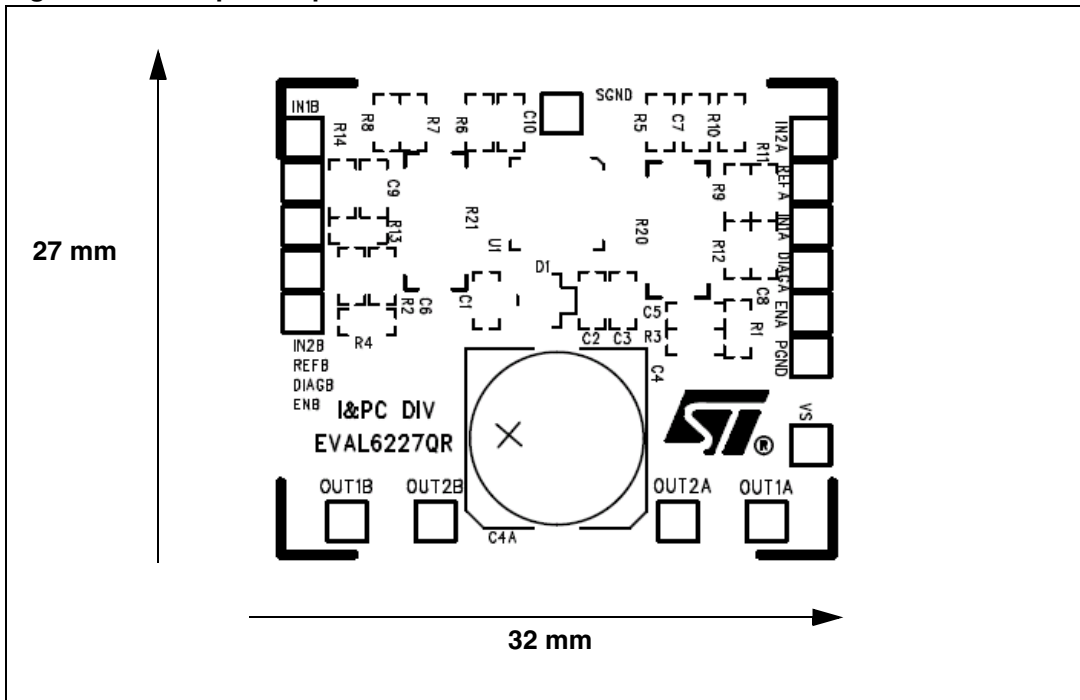


Figure 5. Top layer layout

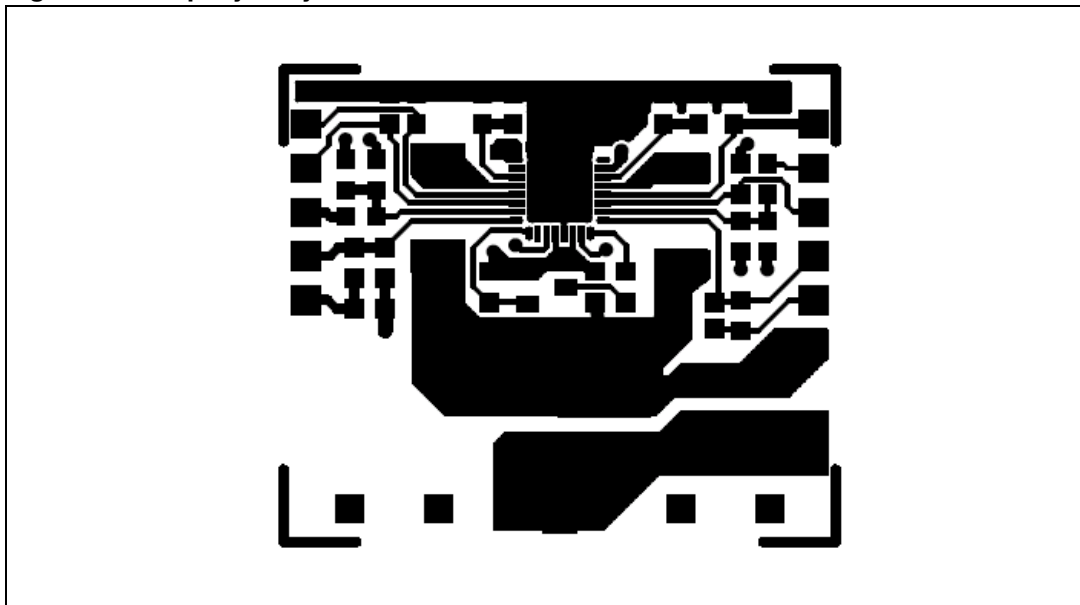
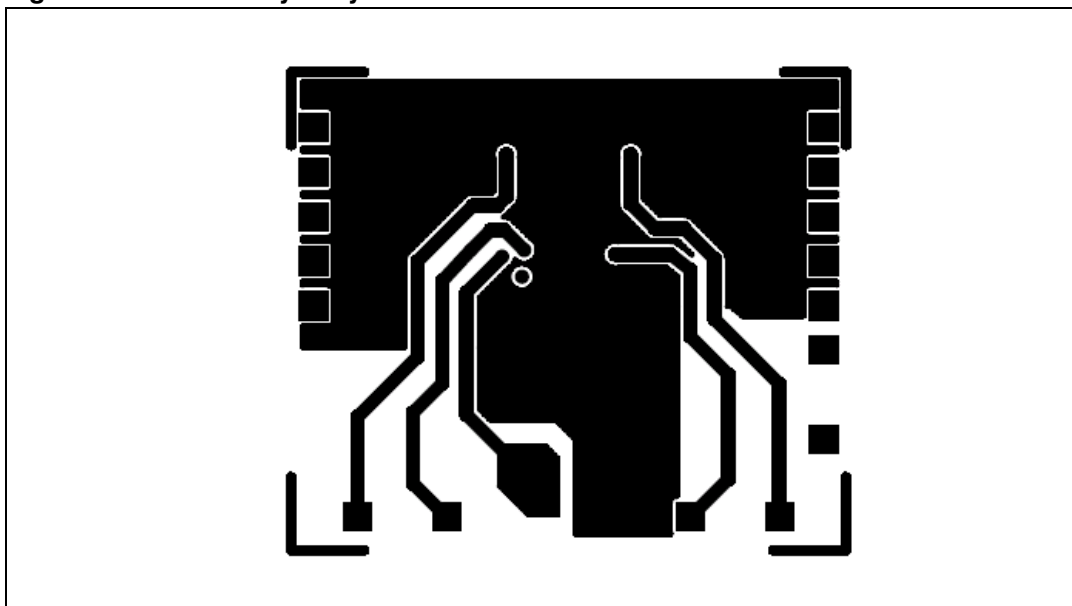


Figure 6. Bottom layer layout





## 2 Revision history

Table 4. Document revision history

| Date        | Revision | Changes         |
|-------------|----------|-----------------|
| 06-Oct-2008 | 1        | Initial release |

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